

DRAGON 32/64 AND TRS80 COLOR
G4BMK RTTY PROGRAM (MK3) - INSTRUCTIONS

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LOADING THE PROGRAM.

CARTRIDGE: Switch the computer off. Insert the cartridge fully, with label uppermost. Switch on the computer and type:

EXEC &HC000

TAPE: Type CLOADM. When the OK message appears, type EXEC.

N.B. Two copies of the program are supplied on the tape. The tape version occupies RAM from &H6F00 to &H7EFF.

EXECUTING THE PROGRAM

The title screen shows a number of questions. To each one, supply an answer and press ENTER. If the default shown is the reply you want, just press ENTER.

The default Baud rate is 45 - the normal amateur speed for Baudot code. For any other speed, type in the actual Baud rate as a number up to 2400. Common Baudot speeds are 45, 50 75 and 100. Common Ascii speeds are 110, 300 and 1200. Receive speeds are not guaranteed above 1000 Baud - some experimentation may be needed in specifying Baud rate for best results.

Question 2 is "TONE INPUT:". Reply "Y" if you want the program to decode actual audio tones fed into the cassette input. The default "N" reply expects TTL level signals from an external tone demodulator (modem) to be fed into the printer port BUSY line. You can still feed audio into the cassette input, and the TV speaker will relay the audio.

"ASCII:". The default "N" selects 5-bit Baudot code - this is the most common code encountered on the air.

Reply "Y" to process signals in ASCII code. The ASCII standard used is 7 data bits plus parity, one or two stop bits. The 'parity' bit is ignored on reception and always generated as a one bit on transmission. Two stop bits are generated.

C/R - Carriage Return

"RX C/R:". Answer "Y" to cause a new screen line to be started whenever a C/R L/F is received. The default "N" will only show a ";", thus keeping more text visible on the screen.

L/F - Line Finish

"TX LINE:". Specify the maximum line length on transmission. The program will automatically send a C/R L/F sequence after this number of characters. In fact, to avoid 'chopped' words, C/R L/F will be sent after a space within 8 characters of this maximum.

"ERASE:". The default "Y" will erase the QSO review buffer - a large area of memory in which all received and transmitted text is stored. Reply "N" to preserve any text in the buffer.

When all questions have been answered, the transceive screen appears. Lines 1-10 are used for received text, lines 11-14 for transmission, line 15 displays the last 31 characters of the type ahead buffer.

THE TRANSCEIVE SCREEN - RECEIVING RTTY

The bottom line is the STATUS line. The letter R at the left end indicates RECEIVE mode.

The letter A or B on the status line indicates if ASCII or BAUDOT code has been selected.

The selected Baud rate is shown, followed by the letter T if direct audio tone decoding is selected.

A graphic tuning indicator in the bottom right corner indicates whether a SPACE (L shape) or MARK (upside-down L shape) signal is being received. When using TONE INPUT on SSB, tune the receiver so the vertical part remains constant. If it flickers, no valid tone of sufficient strength and clarity is being received.

With an RTTY signal tuned in and fed to the computer, finely tune the receiver so the tuning indicator wobbles up and down with received high and low tones. Further slight tuning may be needed to obtain correctly decoded text.

A chequered marker on line 15 is the "type-ahead" cursor. While receiving you can start typing your reply which will scroll across line 15. Up to 4000 characters can be typed while receiving. To make corrections, use the left arrow key and retype. Type ahead is disabled at speeds above 200 Baud.

CONTROLLING THE PROGRAM.

The CLEAR key has been programmed to act like a CONTROL key, i.e. it can be pressed in conjunction with another key to indicate a control action. Such actions are described as CLEAR-x in these instructions. Here are those relevant to reception.

CLEAR-I Toggles an INVERT feature on and off. When INVERT is selected, an 'I' appears on the status line and the program will decode signals in inverted sense of MARK and SPACE - e.g. being received on the wrong side band, or via an inverting receive demodulator (e.g. RDU847). Note that this does not invert the sense of transmitted signals.

CLEAR-L forces the receive software into LETTER shift and is useful if received text is appearing only as numbers and symbols - a letter shift has probably been missed. This action is more easily achieved by pressing the up-arrow key. CLEAR-L is provided for compatibility with the G4BMK AMTOR program.

CLEAR-U Toggles Unshift-on-Space (USOS) mode on and off. When selected, a 'U' appears on the status line. In this mode, the receive software is forced into LETTERS shift whenever a space is received. This mode can be of use when copying noisy signals when a letter shift may be missed, or a false FIG shift received. It can cause problems when receiving groups of numeric data from a primitive RTTY transmit system, which may not insert FIG shift after spaces, e.g. a signal report may appear as 579 TUO TUO. (All G4BMK RTTY programs transmit the correct shift at the start of each word or figure group. One day all RTTY software will be as sensible).

CLEAR-X Clears the type-ahead buffer

CLEAR-Z Erases the screen

CLEAR-T Toggles between TONE INPUT and TTL (BUSY line) INPUT. A 'T' appears after the Baud rate when TONE INPUT is selected.

CLEAR-S (TONE INPUT only). Causes the program to attempt to synchronise to incoming tones. The program is written so that standard 170 Hz shift tones of 1275 and 1445 Hz will be decoded with TONE INPUT. On SSB, all standard and non standard tones can be decoded by careful tuning of the receiver. On FM, such tuning is not possible and so if the received tones appear to be other than 1275/1445 Hz, CLEAR-S can be used. The program will sample the incoming signal looking for 2 distinct tones. A flashing blob in the bottom corner indicates sampling is taking place. A counter in position 6 of the status line shows the number of tones observed. After tone synch. is complete, this will normally show 2, but may be 3 or 4 if either tone had a slight wobble.

After a TONE SYNCH operation, the observed tones will be used as the basis for all further tone decoding. The program can be reset to the 1275/1445 standard by returning to the menu screen.

RECEIVE / TRANSMIT SELECTION

Switching between Receive and Transmit modes is easily done by using the up and down arrow keys as follows.

UP-ARROW selects Receive mode. It is also used to force receive LTRS shift.

DOWN-ARROW selects Transmit mode. The PTT output signals are activated and if the program was not already in Transmit mode, a CR LF LTRS sequence is output, followed by any text from the type-ahead buffer. DOWN-ARROW can also be used to kill transmission of a selected memory or message, output continues with text from the type-ahead buffer.

SHIFT and UP-ARROW selects Receive Standby mode. The transceiver PTT is put into receive, but output to the screen is suppressed until a valid RTTY signal is detected. This is determined by looking for the sequence RY (from an RYRYRY.. message) or a CR LF sequence. This is useful in preventing rubbish from filling the screen while tuning around or waiting for a signal to appear. While in Standby, a 'W' appears instead of 'R' on the status line.

SHIFT and DOWN-ARROW selects Transmit mode, but also clears the type ahead buffer and transmits the contents of memory page 9. Typically this feature is used for transmission of a CQ sequence, and is ideal for contest operation. See later notes on the setting up of memories etc.

PROGRAM COMMANDS

Some features of the program are controlled by typing in a COMMAND. Type BREAK and a question mark appears in the bottom left corner, followed by a flashing cursor. Type in the command followed by ENTER. The following commands are recognised:

nnnn selects a new Baud rate. For nnnn type the rate as a number up to 2400.
B (Begin) returns to the menu.
E selects EDIT for setting up memories.
Q Quit - return to Basic
R selects receive mode (same as UP ARROW)
T selects transmit. (same as DOWN ARROW).
V selects QSO REVIEW/PRINT

TRANSMITTING

See Page 7 for details of interfacing.

On selecting Transmit (via DOWN-ARROW or 'T' command), the PTT signals are activated, and after a short pause a C/R L/F LTRS sequence is sent, followed by any text in the type-ahead buffer. You can continue typing text which will go into the buffer to be sent when transmission has caught up. Text which has actually been transmitted is shown in inverse video.

A number of messages are built into the software. They are selected by typing an exclamation mark followed by a letter denoting the message.

!A sends information about the system you are using.
 !C sends a CQ call including your callsign.
 !D sends "DE (callsign) PSE KKKK"
 !I sends CW IDENT: followed by your callsign in Morse code. (Should not be used by Class B Licencees in the UK).
 !R sends RYRYRYRY..
 !S sends your callsign
 !T sends THE QUICK BROWN FOX...

Normally you can leave it to the program to send C/R L/F at regular intervals (shown as ";" on the screen), but they can be specifically sent by typing ";". C/R L/F must be inserted manually in Ascii mode.

When transmitting Baudot code, the program automatically inserts LTRS shift or FIGS shift when necessary. Also the correct shift is sent at the start of each word or figure group (i.e. after a space). This makes it much easier for listening stations to receive accurately from you.

Characters for which there are no Baudot equivalent, are converted to the nearest match. ">" and "<" send "(" and ")". "#" and "\$" send a Pound sign. "&" sends a BELL symbol.

AUTOMATIC RETURN TO RECEIVE MODE

Two characters are reserved for the purpose of returning the program to receive mode when transmission reaches that point. "@" produces receive mode, and "*" results in receive standby mode.

MEMORY EDITING

Ten memory pages of 480 characters each are available. They can be prepared either using the EDIT facility, or via the "scratchpad" feature described later. Once set up, a memory can be selected for transmission by typing "!" followed by a number 0 thru 9 denoting which page. Selecting a blank memory will cause one space to be sent.

Access EDIT via the E command (type BREAK E ENTER). A blank screen will appear with the question "PAGE ?". Reply with 0 thru 9 and press ENTER. Now type your text. This is a "full-screen text editor" - the arrow keys can be used to move the cursor in 4 directions. Typing SHIFT and right-arrow together will open a gap at the cursor position for missing text to be inserted. SHIFT and left-arrow will delete the character under the cursor.

Pressing CLEAR will erase the current page. If pressed in error, press SHIFT and UP-ARROW to cancel this edit session and return to the "PAGE?" prompt.

Typing a semi-colon will cause a C/R L/F to be sent but the rest of THE CURRENT LINE - ONLY IF ALL SPACES - will not be transmitted (please note the slight change from earlier versions of the program). This makes it easy to create formatted text such as simple pictures or diagrams.

NESTING OF MEMORIES: Memory pages can include references to other pages or any of the pre-programmed messages, e.g. consider the following:

```
PAGE 3      !R!R!1DE !SGOOD EVENING !2
PAGE 1      G9XYZ
PAGE 2      FRED
your callsign G7ABC
```

then sending !3 will actually transmit the following:

```
RYRYRYRY.... (twice)
G9XYZ DE G7ABC GOOD EVENING FRED
```

There is now NO LIMIT to the amount of nesting or looping that can be produced. If a page includes a reference to itself, then a CONTINUOUS OUTPUT can be obtained (until BREAK or DOWN-ARROW is pressed).

Memory page 9 is typically reserved for a CQ sequence, as it is the memory transmitted when SHIFT + DOWN-ARROW is pressed. By terminating the page with "*" or "@", an automatic return to receive mode is obtained. A sample content might be:

```
!R!C!C IN JT00AD !D *
```

TERMINATING AN EDIT SESSION

When you have finished editing a memory page, press BREAK to return to the transceive screen. Now enter a command for the program to continue.

SAVING MEMORIES

Memory pages can be saved on tape or disk for reuse another day. Leave the program, (Q command) and use the CSAVEM or SAVE (Dragon DOS) command of Basic.

```
CSAVEM "PAGES",&H2000,&H33FF,xxxx
SAVE "PAGES",&H2000,&H33FF,xxxx
```

where xxxx is the program start address (&H6F00 or &HC000).

To use this data another day, simply load PAGES as a block of machine code before executing the RTTY program.

```
CLOADM "PAGES"
or LOAD "PAGES"
```

SCRATCHPAD USE OF MEMORIES

While receiving RTTY, (or transmitting), short amounts of text can be put into a memory without missing any received text. This is done by typing the data as if into the type-ahead buffer so that it appears on screen line 15, then using a CLEAR function to transfer line 15 to the chosen memory.

First type CLEAR-H. This will clear the type-ahead buffer and put a "HOLD" on it, (indicated by 'H' on the status line), preventing text from being transmitted while you are setting up scratchpad data. While in HOLD mode, the type-ahead cursor changes to an all yellow square.

Type the name / callsign etc. so it appears on screen line 15. Then hold down CLEAR and at the same time press 0 thru 9 indicating which memory to be used. The whole of screen line 15 will replace the chosen memory. Note that only text actually showing on line 15 goes into the memory, so do not type more than 31 characters. HOLD MODE IS CANCELLED and the type ahead buffer cleared again. To set up another memory this way, start with CLEAR-H again. To cancel HOLD without writing to a memory, repeat CLEAR-H.

The program has an intelligent approach to the sending of memory contents, in that one and only one trailing space is transmitted at the end of any page - so in our nesting example earlier, one space will be sent after G9XYZ, which is just what is wanted.

QSO REVIEW AND PRINTING

All received and transmitted text is stored in a large store in memory. For the tape version approx. 15000 characters are stored, 19000 with the cartridge and 32K ram, 3000 with a cartridge and 16K Tandy. When the store is filled, the oldest data is overwritten.

You can erase the QSO store by replying "Y" to "ERASE:" on the menu screen.

The "V" command enables you to view the store. Type BREAK V ENTER. The oldest data is displayed first. Received text is in normal video, transmitted is in reverse. You can scroll forwards or backwards through the text by pressing down or up arrow. Pressing SHIFT with up or down arrow scrolls 8 lines at a time. A light graphic blob shows at the current point in the store - the latest data is that just before this marker.

TO PRINT FROM THE STORE, scroll the text so that the first data to be printed is at the top of the screen, and type "P". Stop printing by typing BREAK.

SAVING A QSO

The QSO store can be saved to tape or disk as a block of machine code in a similar way to saving memories. Quit from the RTTY program, and type:

```
CSAVEM"QSO",&H3500,yyyy,xxxx
OR      SAVE "QSO",&H3500,yyyy,xxxx
```

where xxxx is the start address of the RTTY program, and yyyy is the address of the top of the store area (&H6EFF for tape, 32k RAM; &H7FFF for cart., 32k RAM; &H3FFF for cart., 16k RAM).

To reload for review/printing another time, use CLOADM or LOAD"QSO" before starting the RTTY program, and reply "N" to "ERASE:". The store area is coincident with the G4BMK AMTOR program, and thus can hold combined text from both modes. The same is true of the memory pages.

USING THE PROGRAM FOR ASCII DATA

Most of these instructions apply to ASCII as well as Baudot. Exceptions:

- The program can receive Ascii at up to 1200 Baud. Transmission is possible at speeds up to 2400 Baud.
- No LTRS/FIGS shift handling is necessary with Ascii.
- Transmit C/R L/F sequences must be inserted manually via the ";" character.
- Not all Ascii characters can be generated, e.g. "@" and "*" are still used to return to receive mode. Lower case letters can not be produced.

LEAVING THE RTTY PROGRAM

The "Q" command will allow you to QUIT from the RTTY program, returning to BASIC. If using a multiple cartridge, you can immediately switch to another mode by EXECing the appropriate start address.

INTERFACING AND EXTERNAL HARDWARE - RECEPTION

For reception with direct tone input, a high level of audio into the cassette port is desirable - at least that used for loading programs from cassette. Audio is best taken from an extension speaker outlet to obtain sufficient drive. A clear, strong audio signal is a necessary. Best results will be obtained by using an outside aerial, away from computer and TV interference. When dealing with unknown signals, try changing Baud rate, toggling the INVERT feature, and on SSB tune the receiver finely until correct decoding is obtained. The on-screen tuning indicator will stay high when tones are too high, low for tones too low, and will alternate up and down when tuning is about correct. The presence of an interfering heterodyne on the signal, or other interference, will cause rubbish to be displayed.

Generally only Baudot signals should be decoded by direct audio. Ascii signals usually require a suitable modem (demodulator).

The addition of an audio filter between the receiver and computer will greatly improve reception of weak or noisy signals. The "FP1" by PNP Communications is suitable, but note that filters are designed for specific tones, and this means that one must choose whether Amateur 170Hz or Commercial 425 Hz shift signals (or 850 Hz) are to be received, and order an appropriate filter unit.

Further improvement may be obtained by using an external tone demodulator as well as filter. Many designs are available. Units by PNP Communications, B&J, and the STSC by BARTG, among many, are compatible with this program. Demodulators generally will work with a lower level of audio e.g. from a headphone socket, and the demodulated signal is fed to the busy line of the Centronics (Dragon) or RS232 (Tandy) port. The program normally expects 5v on this line to represent a MARK, and 0v to represent a SPACE. With the Dragon, take care that no voltage outside of this range is connected to the BUSY line.

TRANSMISSION

The normal approach for transmission on SSB or FM is to drive a two-tone generator from the Centronics STROBE or Tandy RS232 output line, feeding the resultant audio into transmitter MIC socket. Start with a minimum of audio and increase to about half normal TX power as RTTY has a 100% duty cycle which can cause a transmitter to overheat at full power. On FM, too much audio will cause excessive deviation and distortion.

RTTY "Terminal Units" such as the ST5 or FP1/PL1 comprise a receive filter/demodulator and transmit tone generator. The computer output lines are only designed to provide/sink very low levels of current. If in doubt about the current requirements of a tone generator, it is advisable to connect it to the computer via a 1k series resistor. If this results in insufficient drive to produce the two tones, then a buffer circuit must be used. With the Dragon, ensure that the STROBE output is not connected to any point likely to have voltages below 0v or above 5v present.

PTT SWITCHING

The contacts of the computer's cassette relay are closed while the program is in Transmit. The relay will drive the PTT input on most 12v transceivers directly. The relay contacts are floating with respect to the computer - no internal connection exists. They are internally shunted by a pair of back-to-back diodes.

2 alternative PTT switching arrangements are provided for compatibility with G4BMK AMTOR, e.g. for using the AMCK1 interface. Operation is as described in the AMTOR program instructions.

SUMMARY OF BMKRTTY OPERATION

CLEAR FUNCTIONS (hold down CLEAR while typing the letter or number).

CLEAR-H Toggle HOLD of the type-ahead buffer for scratchpad memory use.

CLEAR-I Toggle receive INVERT feature.

CLEAR-L Force receive LTRS shift

CLEAR-S Synchronise to received tones (Tone input only).

CLEAR-T Toggle between Tone input or TTL (Busy line) input.

CLEAR-U Toggle Unshift-on-space mode for reception.

CLEAR-X Erase type-ahead buffer

CLEAR-Z Erase transceive screen.

SPECIAL KEYS

UP ARROW select receive mode. Also force receive LTRS shift

SHIFT+UP ARROW select receive standby

DOWN ARROW select transmit. Also kill transmission of current memory.

SHIFT+DOWN ARROW select transmit and send memory page 9

BREAK select command mode

@ auto-return to receive

* auto-return to receive standby

PROGRAM COMMANDS (Type BREAK, command, ENTER)

B BEGIN go to menu

E EDIT a memory

Q QUIT from BMKRTTY

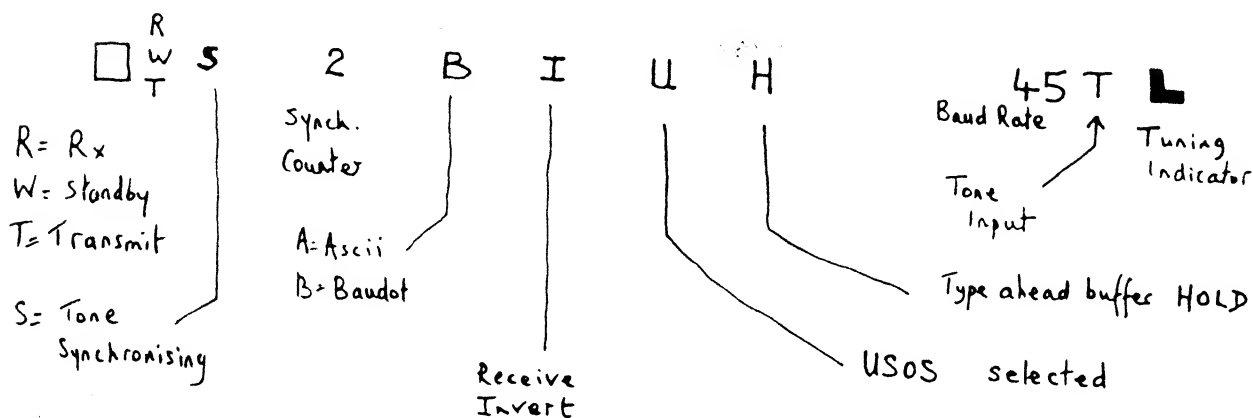
R Receive

T Transmit

V VIEW - QSO review/print

THE STATUS LINE

Any of the following indicators may appear on line 16, dependant on which options are selected.



INTERFACING

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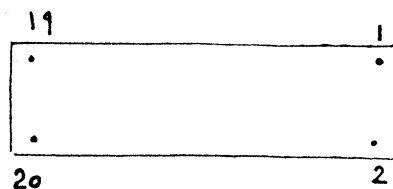
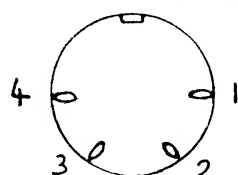


FIG 1

- 1 'STROBE' TTL TRANSMIT DATA
- 2 +5v FROM COMPUTER
- 3,5,7,9,11 To AMCK1 for PTT Switching (optional)
- 6,8,10,12 GROUND 0v

20 'BUSY' TTL RECEIVE INPUT DATA FROM DEMODULATOR

FIG 2



- 2 'BUSY' RECEIVE INPUT DATA FROM DEMODULATOR
- 3 GROUND 0v
- 4 TRANSMIT DATA OUT $\pm 12v$

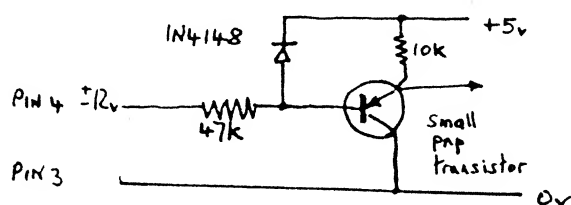
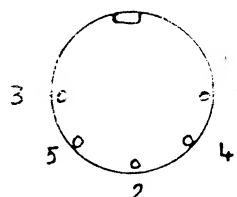


FIG 3

FIG 4



- 1 & 3 Cassette Relay (PTT Switch)
- 2 GROUND
- 4 Audio in
- 5 PTT Signal

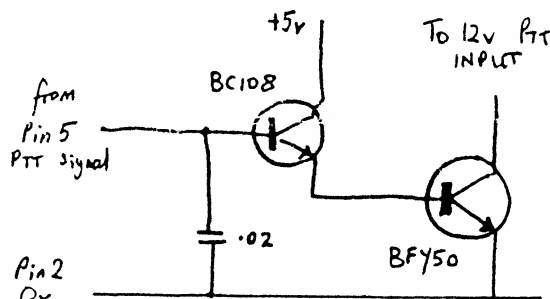
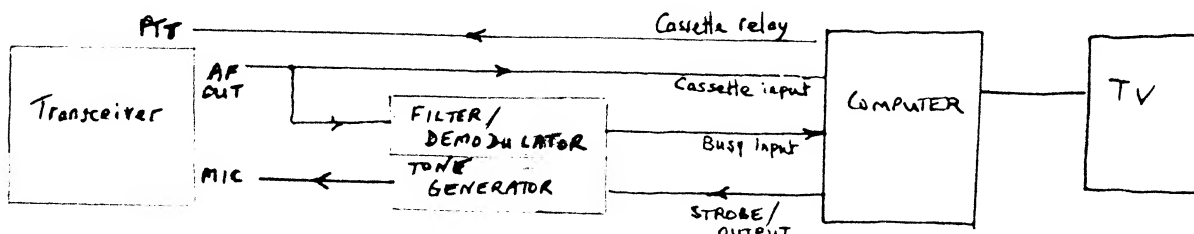


FIG 5



ST5 INTERFACING

The ST5 with TTL interface (ST5C) can be connected directly to the computer. Do not attempt to obtain the 5v supply from the computer. A separate 5v supply at 250 mA should be used. Alternatively, use $\pm 12v$ supplies and dispense with the DC/DC converter.